

16. (New) The method according to claim 1, comprising laser thermal annealing to reflow the deposited Cu or Cu alloy.

REMARKS

Claims 1 through 16 are pending in this application. Claim 10 has been amended at the suggestion of the Examiner and new claim 16 added. Care has been exercised to avoid the introduction of new matter. Indeed, adequate descriptive support for the present Amendment should be apparent throughout the originally filed disclosure as well as original claim 3. Applicants submit that the present Amendment does generate any new matter issue.

A clean copy of amended claim 10 and of new claim 16 appear in the Appendix hereto.

Drawing Objection

The Examiner asserted that Fig. 1 should be provided with a legend such as -- PRIOR ART--. In response it is proposed to amend Fig. 1, as indicated in red on the attached photocopy, to provide the legend --PRIOR ART--, consistent with the Examiner's suggestion. A formal Request for Approval of Drawing Amendment is submitted concurrently herewith.

Claim Objection

The Examiner objected to claim 10 identifying an informality. In response, claim 10 has been amended at the suggestion of the Examiner to cure the perceived informality,

thereby overcoming the stated basis for the objection. Accordingly, withdrawal of the objection to claim 10 is solicited.

Claims 1, 2, 4, 5, 7, 8, 11 and 13 through 15 were under 35 U.S.C. §103 for obviousness predicated upon Zhao et al. in view of Ritzdorf et al.

In the statement of the rejection, the Examiner concluded that one having ordinary skill in the art would have been motivated to modify the methodology of Zhao et al. by employing laser thermal annealing in view of Ritzdorf et al. This rejection is traversed.

Applicants submit the Examiner did not establish the requisite realistic motivation to modify the methodology of Zhao et al. by employing laser thermal annealing while retaining the ammonia. In this respect, Applicants would stress the Examiner must make a "thorough and searching" factual inquiry and, based upon that factual inquiry, explain why one having ordinary skill in the art would have been realistically motivated to modify the particular annealing technique disclosed by Zhao et al. by employing laser thermal annealing merely in lieu of the heating means vis-à-vis the entire laser thermal annealing disclosed by Ritzdorf et al. *In re Lee*, 237 F.3d 1338, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002). Applicants submit that if a "thorough and searching" factual inquiry is made, the motivation to arrive at the claimed invention does **not** exist.

It should be apparent that Ritzdorf et al. disclose something **more** than laser thermal annealing. Ritzdorf et al. disclose a different type of annealing process from that disclosed by Zhao et al. employing various types of ambients, including ammonia. It should be noted that the annealing process disclosed by Zhao et al. is traditional and it is

performed at a temperature of 150°C to 400°C for 15 to 180 minutes. Again, various different ambients are disclosed, including argon and ammonia.

However, Ritzdorf et al. teach away from the conventional annealing. Rather, Ritzdorf et al. disclose a particular type of deposition technique enabling annealing at temperatures considerably below that conventionally employed. Conspicuously **absent** is any mention of ammonia during such a different type of annealing. As apparent from the abstract, annealing is conducted below 100°C and can even be conducted at ambient room temperature. The disclosed annealing process again, makes no mention of ammonia.

Assuming, arguendo, that one having ordinary skill in the art would have been motivated to employ the annealing technique disclosed by Ritzdorf et al. in lieu of the annealing technique disclosed by Zhao et al., and that is a big **if** with which Applicants do not agree, then ammonia would **not** be used and different temperatures would be employed. It is in this context, and only in this context, that laser thermal annealing is disclosed. Accordingly, **if**, and again that is a big **if** with which Applicants do not agree, one having ordinary skill in the art would have been motivated to employ the annealing technique of Ritzdorf et al. in the methodology of Zhao et al., ammonia would **not** be used in the ambient. In other words, **if** the methodology of Zhao et al. is modified in accordance with the teachings of Ritzdorf et al., the claimed invention would **not** result because ammonia would not be used. Rather, the low temperature annealing technique of Ritzdorf et al. would be employed. *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 USPQ2d 1434 (Fed. Cir. 1988).

Based upon the foregoing, Applicants submit that the imposed rejection of claims 1, 2, 4, 5, 7, 8, 11 and 13 through 15 under 35 U.S.C. §103 for obviousness predicated upon Zhao et al. in view of Ritzdorf et al. is not factually or legally viable and, hence, solicit withdrawal thereof.

Claims 6 and 9 were rejected under 35 U.S.C. §103 for obviousness predicated upon Zhao et al. in view of Ritzdorf et al. and Cabral et al.

Claim 12 was rejected under 35 U.S.C. §103 for obviousness predicated upon Zhao et al. in view of Ritzdorf et al. and Islam et al.

Claim 10 was rejected under 35 U.S.C. §103 for obviousness predicated upon Zhao et al. in view of Ritzdorf et al., Cabral et al. and Islam et al.

Each of the above rejections under 35 U.S.C. §103 of claim 6 and 9, claim 12 and 10 under 35 U.S.C. §103 is traversed. Specifically, each of claims 6, 9, 10 and 12 depend ultimately from independent claim 1. Applicants incorporate herein the arguments previously advanced in traversing the imposed rejection of claim 1 under 35 U.S.C. §103 for obviousness predicated upon Zhao et al. in view of Ritzdorf et al. Indeed, as previously argued, if the low temperature annealing technique of Ritzdorf et al. is applied in the methodology of Zhao et al., ammonia would not be employed and, hence, the claimed invention would not result. *Uniroyal, Inc. v. Rudkin-Wiley Corp., supra*. The additional references to Cabral et al. and Islam et al. do not cure the argued deficiencies in the attempted combination of Zhao et al. and Ritzdorf et al.

Applicants, therefore, submit that the imposed rejection of claim 6 and 9 under 35 U.S.C. §103 for obviousness predicated upon Zhao et al. in view of Ritzdorf et al. and

Cabral et al., the imposed rejection of claim 12 under 35 U.S.C. §103 for obviousness predicated upon Zhao et al. in view of Ritzdorf et al. and Islam et al. and the imposed rejection of claim 10 under 35 U.S.C. §103 for obviousness predicated upon Zhao et al. in view of Ritzdorf et al., Cabral et al. and Islam et al., are not factually or legally viable and, hence, solicit withdrawal thereof.

New Claim 16

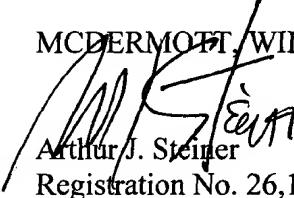
Claim 16 is free of the applied prior art by virtue of its dependence upon independent claim 1, the patentability of which has been argued *supra*. Moreover, Applicants separately argue the patentability of claim 16 which requires laser thermal annealing to reflow the Cu or Cu alloy. No such teaching appears in either of Ritzdorf et al. or Zhao et al. Indeed, the primary reference to Zhao et al. speaks only of annealing, which is not reflowing, to change the grain size. Ritzdorf et al., the allegedly teaching reference, **teaches away** from the claimed invention by specifying low temperature annealing under 100°C or room temperature. Thus, clearly, neither of Zhao et al., nor Ritzdorf et al., taken singly or in combination, would have lead one having ordinary skill in the art to the claimed invention. Indeed, Ritzdorf et al. teach away from the claimed invention by advocating a low temperature annealing technique, underscoring the **nonobviousness** of the claimed invention as a whole. *In re Bell*, 991 F.2d 781, 26 USPQ2d 1529 (Fed. Cir. 1993); *Specialty Composites v. Cabot Corp.*, 845 F.2d 981, 6 USPQ2d 1601 (Fed. Cir. 1988); *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986). Applicants, therefore, submit that claim 16 is clearly free of the applied prior art.

Applicants acknowledge, with appreciation, the Examiner's indication that claim 3 contains allows subject matter. Based upon the argument submitted supra, it should be apparent that the objection and rejections have been overcome, and that all pending claims in are in condition for immediate allowance. Favorable consideration is, therefore, respectfully solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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APPENDIX

Claim 10 now read as follows.

10. (Amended) The method according to claim 9, comprising:

A1

treating the upper surface of the Cu or Cu alloy in a plasma containing NH₃ to remove copper oxide therefrom; and
depositing a silicon nitride capping layer on the plasma treated surface by plasma enhanced chemical vapor deposition.

New claim 16 read as follows.

A2

16. (New) The method according to claim 1, comprising laser thermal annealing to reflow the deposited Cu or Cu alloy.

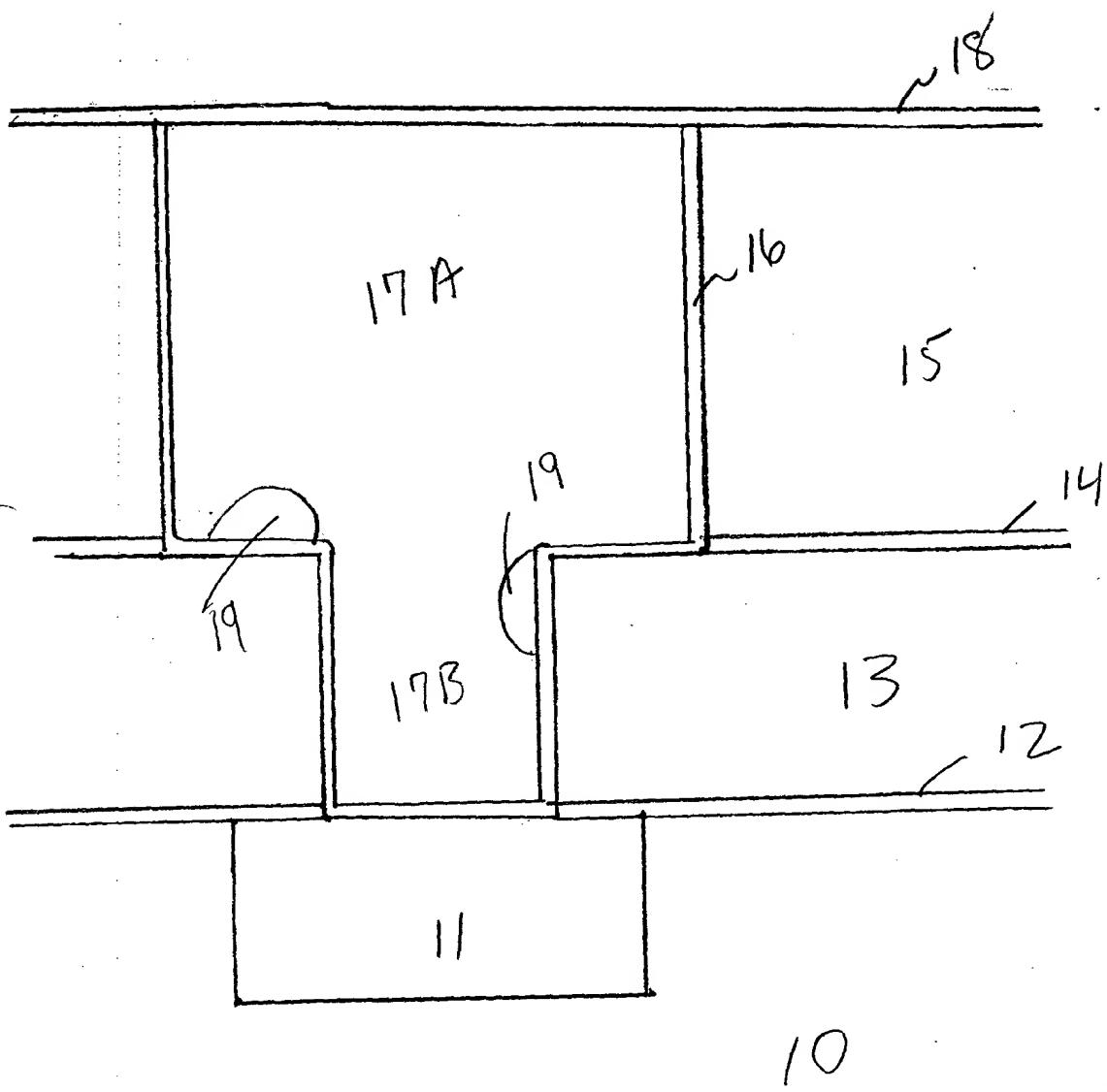


FIG. 1
PRIOR ART